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By-Henderson, Joe M.; Griffey, Bert

Production of Closed-Circuit Television Programs for Improving Instruction in Professional Health and Physical Education Courses at the Undergraduate Level.

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To study the adaptability of semi-portable closed-circuit television equipment on remote location, six videotape programs were produced at Midwestern University for use in physical education courses. The programs dealt with "Knee Injuries," "Rehabilitation of Knee Injuries," "Teaching Tumbling by Progression," "The Mini-Tramp," "Introduction to Trampolining," and "The A.A.H.P.E.R. Youth Fitness Test." Inexpensive videcon cameras and one-inch videotape recorders were adequate for programs showing gross motor skills, but programs with more visual detail such as human anatomy required more expensive recording equipment. Technical problems (lighting variables, power supply, camera locations) and production problems (training assistants, production of art work, selection of equipment) influenced recommendations for a television studio with a staff of technicians headed by a professional producer and for further study in the improvement of instruction through closed-circuit television. The portable instant-replay capabilities of the equipment and the resulting flexibility in production and presentation favored these developments. (TI)

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Final Report
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PRODUCTION OF CLOSED-CIRCUIT TELEVISION PROGRAMS FOR IMPROVING INSTRUCTION IN PROFESSIONAL HEALTH AND PHYSICAL EDUCATION COURSES AT THE UNDERGRADUATE LEVEL

August, 1968

U. S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
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Joe M. Henderson
Bert Griffey

Midwestern University

Wichita Falls, Texas

August 30, 1968

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SUMMARY

The purpose of the study was to examine different methods and techniques for producing educational television programs on remote locations, to produce a number of educational videotape programs for use in improving instruction in selected areas of professional physical education, and to examine the flexibility and adaptability of semi-portable closed-circuit television equipment under a variety of conditions.

The six videotaped programs representing the final product of the project were researched, planned, and produced for use in different courses in professional physical education courses. The programs encompass three general areas of instruction in physical education: "Knee Injuries" and "Rehabilitation of Knee Injuries," "Teaching Tumbling by Progression," "The Mini-Tramp," "Introduction to Trampolining," and "The A.A.H.P.E.R. Youth Fitness Test."

A number of problems were identified and classified as either technical or production limitations. Consideration of these factors may be helpful to those persons planning to purchase portable closed-circuit television equipment or to those building new facilities which will include C.C.T.v. Technical problems included lighting variables, power supply, camera locations, and weather. Production problems included training assistants, production of art work, selecting of equipment, and background music.

Two criteria were identified for selecting equipment for producing instructional television programs on remote locations for physical education purposes. First, the equipment should be small and light-weight so that two people can transport it and make it operational in a short period of time. Second, for programs dealing with gross motor skills, such as tumbling, trampolining, weight lifting, and golf, etc., the inexpensive videcon cameras and one-inch videotape recorders were completely adequate. Programs requiring more detail, such as human anatomy, charts and graphs, black and white pictures, and motion pictures, required more expensive cameras and recording equipment.

Recommendations Resulting from the Study:

1. The University should provide a Television Studio with a staff of technicians headed by a professional media producer with the responsibility of assisting in production in all areas of educational television.

2. Television equipment, facilities, studio, and personnel should be available to University Faculty on short notice.

3. It should not be necessary for any instructional staff member to become competent in assembling, adjusting, organizing, or transporting television equipment.

4. Faculty members from the various University Departments should be encouraged and assisted in undertaking seminar studies.

5. Teachers and administrators should work toward creating receptive attitudes toward educational television on the part of administrators, instructional staff, and students.

6. Attempts should be made to involve future teachers in all aspects of using C.C.T.V. for educational purposes.

7. Provisions should be included in departmental budgets for supporting research and development in educational television.

8. Educators should make the final decision about the planning, development, and educational application of television.

9. Further study should be carried out to investigate the possibilities for program production and improvement of instruction through C.C.T.V. in all areas of Health, Physical Education and Recreation.

CHAPTER I

INTRODUCTION

Background for the Study

Midwestern University is rapidly developing an extensive closed-circuit television system capable of providing instructional television service throughout the campus.

Construction began August 25 on a television studio which will greatly increase the University's production and distribution capacity. The studio equipment consists of two viewfinder cameras, two industrial cameras, one camera-chain, one two-inch videotape recorder, and a radio-frequency distribution system. Although the studio will be comparatively small, it will provide the technical capacity for producing broadcast quality programs. In addition to the new studio facility, the Television Department has acquired several new pieces of equipment which will greatly increase the flexibility of the present C.C.T.V. system.

The Physical Education Department and the Education Department are developing significant branches to the Television Department's Science Building C.C.T.V. system. The Education Department branch will provide both record and playback facilities in the Ferguson Building. The Department will originate programs in the Ferguson Building and send the signals through the distribution system to the Science Building for videotaping. The programs may be played back to any number of monitor-receivers.

The new Physical Education C.C.T.V. system will consist of two one-inch videotape recorders, six monitor-receivers, a radio frequency distribution amplifier, and access to the campus-wide distribution system. Through this system, any monitor-receiver within the building will have access to seven different program sources: either of the two one-inch videotape recorders located in the new Physical Education Building, either of three videotape recorders in the Television Studio, to live broadcasts on campus, and to any commercial broadcast. The Physical Education Department will have the capacity to originate and distribute television programs within the new building or through the campus-wide distribution system.

Purpose of the Study

The purpose of the study was to produce several videotape programs for use in professional physical education courses at the undergraduate level. Because of the development of closed-circuit television at Midwestern University and the extensive provisions for C.C.T.V. in the new Physical Education Building, much of the work done during the study was concerned with the investigation of two problems:

1. to examine the limitations and capabilities of semi-portable C.C.T.V. equipment for producing videotape programs in different locations under varying conditions.
2. to experiment with methods and techniques for producing broadcast-quality instructional television programs on remote locations.

Limitations of the Study

Midwestern University did not, at the time of the study, provide the services of a professional staff member trained in production of media materials. Although both project investigators had graduate courses in educational television production, neither had had an opportunity to actually produce a broadcast-quality program. Because of lack of experience in television production on remote locations, the efforts of this project were primarily exploratory.

CHAPTER II

METHODS

The major efforts of the project can be classified into six areas: researching and writing scripts, training technical assistants, preparing art work, motion picture and close-up photography, experimenting with the flexibility of semi-portable C.C.T.V. equipment, and rehearsing and recording programs.

Training Technical Assistants

Since the Midwestern University Television Department did not provide a television studio or technical assistants, training student assistants required a significant part of the effort of this project. Four undergraduate physical education major students with a minimum of two years of college work remaining were selected to work on the project.

The four technical assistants learned to assemble the semi-portable equipment for a four-camera operation with an announcer, live talent, camera-chain, and external audio input. They learned to operate television cameras and to thread, record, and playback videotape programs on three different videotape recorders.

Preparing Scripts

The program topics were selected on the basis of two criteria. First, programs were selected which would provide useful integrative material for one or more undergraduate courses at Midwestern University. Second, programs were selected which would effectively demonstrate the value of instructional television in improving instruction. Each program was within the field of specialization of one of the investigators.

Production

Recording sessions were held in one of four locations: the studio-classroom, the Gymnasium, the Gymnasium Foyer, and the weight-training room. Identifying and solving production problems in the different locations provided valuable experience which should allow more realistic planning for future programs.

Equipment Testing

The different production locations allowed examination of flexibility and adaptability of the semi-portable closed-circuit television system. Obviously, persons with experience in remote program production would not have encountered the same problems as experienced throughout this project. Because of the many technical problems, the more experienced person probably would not have attempted to produce a program under such conditions.

The project allowed the investigators to identify and to experiment with procedures for overcoming problems encountered when producing programs in remote locations.

CHAPTER III

EQUIPMENT

C.C.T.V. Production Unit

The basic C.C.T.V. system used for most program production consisted of a camera control console, two G.P.L. Viewfinder 900 videcon cameras mounted on Hercules tripod-dollies, two G.P.L. industrial videcon cameras, and one Ampex 660-B videotape recorder with "Edicon." (See Figures 2 and 5.)

The camera console consisted of camera controls and monitor for each of four cameras, a line monitor, a Dynair Switcher-fader, E.I.A. line synchronization, video and pulse distribution amplifiers, a McMartin audio mixer, and a Techtronic wave form analyzer.

The two viewfinder cameras were mobile and convenient. They could be quickly dismounted from the dolly and tripod for transportation or storage. Both viewfinder cameras were equipped with intercom circuits which allowed camera direction from the console. Both were equipped with canon zoom lenses. The two industrial cameras were mounted on tripod-dollies and were equipped with either zoom or close-up lenses.

Other pieces of equipment which were used regularly as integrated parts of the C.C.T.V. system included a turntable, 16 mm. motion picture projector, slide projector, an overhead projector, a 23-inch monitor-receiver, a 9-inch monitor, and several microphones.

Additional Equipment Needed

Camera-Chain

A piece of equipment which was sorely needed for the project was a camera-chain equipped with both 16 mm. motion picture projector and 35 mm. slide projector. The lack of a camera-chain necessitated an arrangement of projectors and television cameras which allowed us to produce the same effects. (See Figure 7.) Three projectors were adjusted at the proper distance and angle from a 5x4 projection screen so that all three cast the same size image on exactly the same area. A television camera was then focused on the projection area. This arrangement required a considerable amount of time to prepare, adjust and operate, but the results were acceptable.

Camera Lenses

Another piece of equipment which would have contributed to better production was a wide-angle lens. In several cases, we found that the space was not sufficient to allow cameras equipped with zoom lenses to cover a suitable area.

CHAPTER IV

TECHNICAL PROBLEMS

Physical Characteristics

The first and probably the most obvious problem encountered with the equipment was its physical characteristics. The camera control console was 42 inches wide, 36 inches high, and 72 inches long, and weighed almost 600 pounds. Since 36 inches is a standard door width, the 42-inch-wide console severely limited the mobility of the equipment. Since it was impossible to store the console in a locked storeroom, it was left in passageways when not in use. The problem of width was temporarily overcome by mounting the equipment in a vertical rack for a two-camera operation. (See Figure 6.) The vertical rack measured 23x224x72 inches and was very useful for producing programs in remote locations; but the two-camera capacity limited production techniques. The camera tripods and dollies offered a similar problem because of width of the base; but they could be easily disassembled for passage through narrow doorways, up stairs, and for storage in small rooms.

When the complete system was stored in one room, it required an area of about 400 square feet or about one-third of an average-size classroom.

Lighting

Proper lighting proved to be a troublesome problem in almost every situation. In some cases there was insufficient light; in some cases there was too much light; in some cases the lighting was constantly changing; and in some cases the lighting interfered with camera angles and picture composition.

The ideal situation would, of course, be a television station in which all lighting could be controlled.

Studio-classroom lighting.--Ideal lighting was produced in a classroom which had no external lighting. The ceiling was 8 feet 0 inches, with white acoustical material and recessed flourescent fixtures. In addition to the standard flourescent lighting, two 300-watt quartz flood lights and one 400-watt quartz spot light were suspended from the acoustical ceiling framework. (See Figure 8.)

Because of the low ceiling, it was difficult to get adequate picture composition. It was difficult to avoid showing the flourescent fixtures in the picture. When this happened, there was immediate picture distortion and "burn-in." Also, when flourescent lighting was used exclusively, there was a 60-cycle pulse which was slightly noticeable.

Gymnasium lighting.--The most severe lighting problems were encountered in the gymnasium. The greatest problem was that posed by the windows which were arranged on two levels on the north and south sides. When a window was brought into a field of view, immediate distortion occurred and picture quality became unusable. Temporarily covering the windows with dark paper proved unsuccessful. The two rows of windows caused a glare on the gymnasium floor which at times was as intense as the window light. (See Figure 14.)

The third lighting problem and one that eventually proved to be quite troublesome was a constantly changing light level. As the sun moved to the west, the light level steadily decreased. On cloudy days, large dark clouds moving slowly overhead caused changes in light levels which required immediate camera adjustment. Another problem was that of having bright spots on the gymnasium floor and walls. These rapidly-changing light levels required constant vigilance of the camera controls. On several occasions it was necessary for cameramen to change the lens "f" stop adjustments several times in one hour.

The most desirable lighting was produced in the gymnasium at night with 100 per cent artificial lighting. Normal gymnasium lighting was sufficient, although picture quality was slightly reduced.

Power supply.--Standard power supply provisions proved to be completely inadequate. When using a classroom or any typical teaching station for television purposes, additional power supply provisions were needed. Our complete operation required 110-volt receptacles for the camera console, two monitor-receivers, one recorder, one motion picture projector, one overhead projector, one slide projector, and three quartz lights.

In addition to the problem of inadequate power supply in the form of an insufficient number of receptacles, we discovered that the standard two-wire 110-volt supply found in many older buildings was inadequate. When two-wire rather than three-wire 110-volt grounded power supply was used, we encountered problems with the sync-generator and videotape recorder tracking.

Camera-stations.--Picture composition and effective switching and fading contribute to the production of interesting programs. We found that external, uncontrolled lighting, windows, and glare

on walls and floor restricted adequate program production by restricting camera placement and movement. This inability to produce good picture composition severely limited program quality, especially when production involved large pieces of equipment such as a trampoline, tumbling mats, and weight-training apparatus.

Weather

Heat and humidity proved to be the television equipment's greatest enemies. When the equipment was operated in a classroom building with temperature maintained at 75 degrees and humidity 15 per cent, camera adjustments could be left almost unchanged. When the equipment was moved to a building without air conditioning and daytime temperature reached 107 degrees and humidity 92 per cent, the equipment became inoperable.

Heat

At times it was impossible to adjust the cameras to produce acceptable signals because of the intense heat. The videotape recorder suffered also. As the temperature climbed, it required more frequent cool-down periods. Several times it was necessary to completely shut down the equipment for cooling.

Humidity

Humidity caused problems with the videotape recorder and at times when it rose to 80 per cent, the recorder became inoperable. As the humidity increased, the drag across the recording head drum became so great that the recorder was turned off automatically by the tactometer mechanism. This was probably a problem with the videotape rather than the recorder. One brand of videotape operated better under high temperatures and humidity conditions than did another.

CHAPTER V

PRODUCTION PROBLEMS

Obviously the equipment described in previous chapters was not broadcast quality; however, we set our goal as broadcast quality so that the programs would demand extensive investigation of different production methods and techniques under varying situations.

Technical Assistants

The project began with a two-week training program which was as much of a training program for the project director as it was for the four student assistants. Both professional staff members concentrated on program research, script writing, and program direction, while the student assistants concentrated on camera operation, audio controlling, and equipment handling and operation. The training period included production of different types of programs in the studio-classroom.

Previous experience had proved that if technical and production assistants were familiar with the program-topic, the entire process operated much more efficiently. Knowledge of the program-topic proved very helpful, especially when videotaping the program on knee injuries. A cameraman lacking knowledge of human anatomy would have had a difficult time following directions calling for close-ups on the anterior cruciate ligament or the intercondyloid fossa.

An interesting observation was that the two women assistants demonstrated as much skill and ability in handling the equipment as the two men assistants. At times their gentle handling of expensive equipment was more assuring than the sometimes aggressive and less graceful movements of the men.

Six weeks of part-time technical assistance was obviously not enough time to develop a level of professional skill, but the program quality demonstrates that their work was at least adequate.

Art Work

Broadcast-quality programs require many forms of art work including photographs, motion picture film, black and white prints,

35 mm. slides, and different forms of title cards, transparencies, models, and numerous props.

Fortunately, both investigators were interested in photography as a hobby and were able to produce black and white prints, slides, and motion pictures without assistance. Title cards and overhead transparencies were prepared by using poster board and "Letraset" instant lettering sheets.

Although the art work was expensive and time consuming, we felt that it was a necessary part of production. In one case, close-up photography and motion pictures provided the basis for the program.

One-Camera Versus Two-Camera Production

Program quality depends to a great extent on picture composition. Cameras equipped with viewfinders, adjustable tripods, dollies, zoom lenses, and intercoms are certainly more adaptable than those without such equipment. Several test programs were produced in which only one camera was used. It was obvious that the video portion was not nearly as interesting.

Background Music

Selection of suitable background music proved to be a problem. We concluded that suitable music has not been written for such subjects as rehabilitating the knee after injury, diagnosing injuries, or administering the A.A.H.P.E.R. Youth Fitness Test.

Fig. 1. Camera control console feeding audio and video signals to a one-inch videotape recorder.

Fig. 2. Two cameras allow interesting mixtures of angles, wide shots and close-ups.

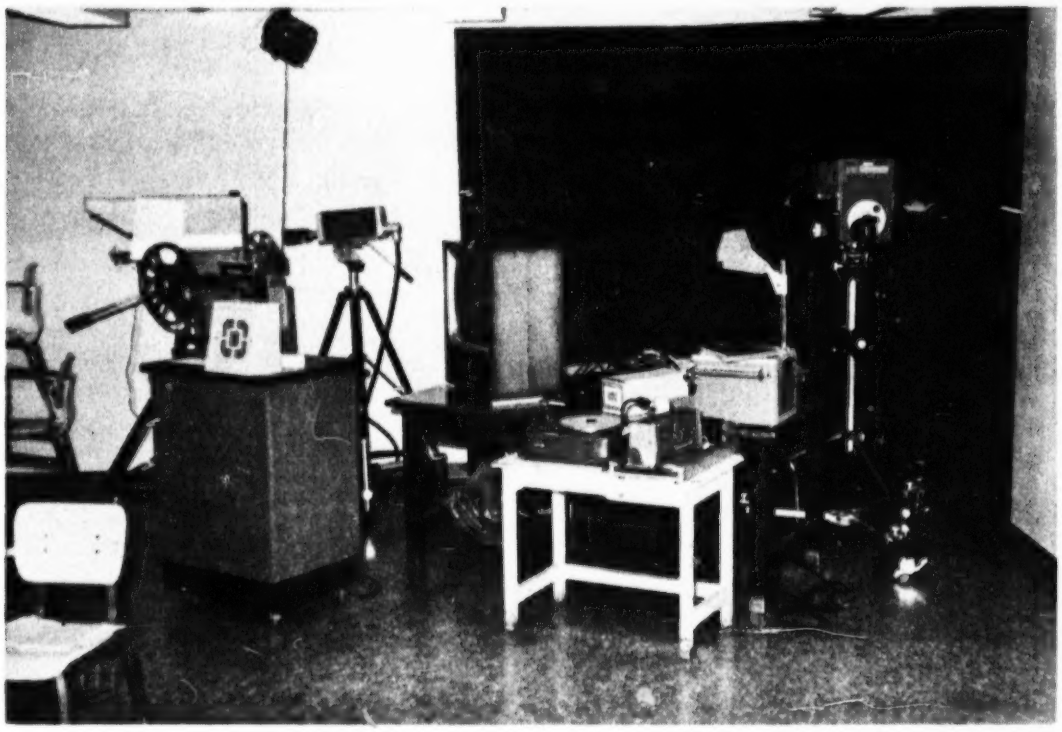

Fig. 3. Equipment stored in a classroom.

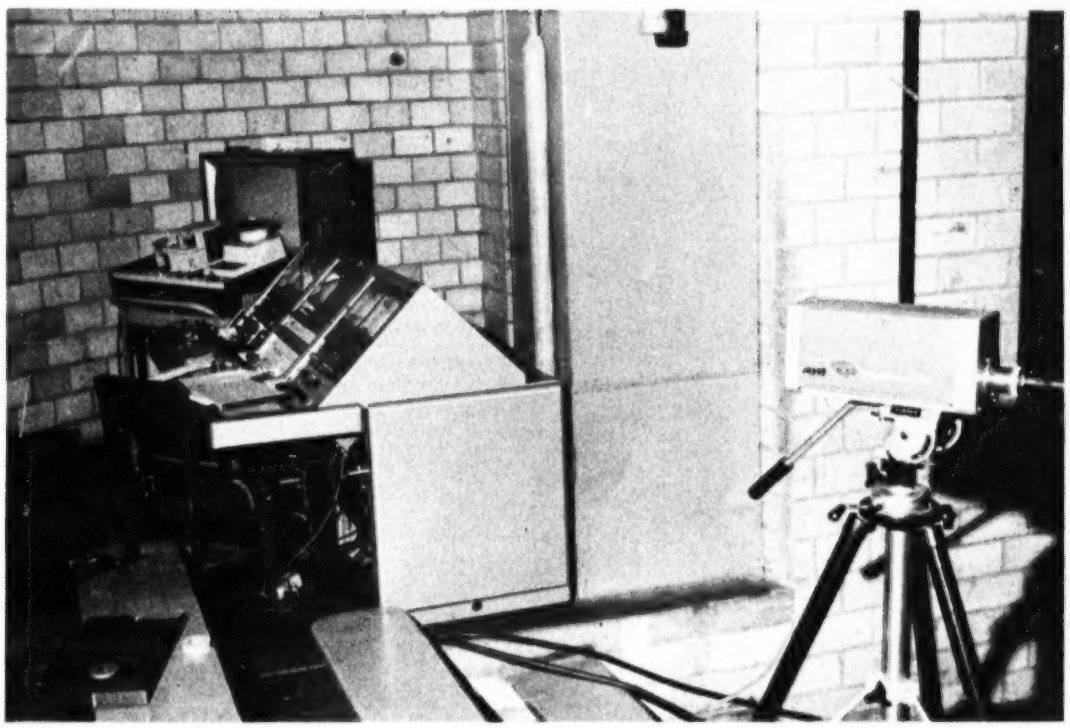

Fig. 4. The camera control console was too wide to pass through a standard doorway and had to be left overnight in passageways.

Fig. 5. The console had to be located in the hall during recording sessions. The small camera is focused on a title card taped to the wall.

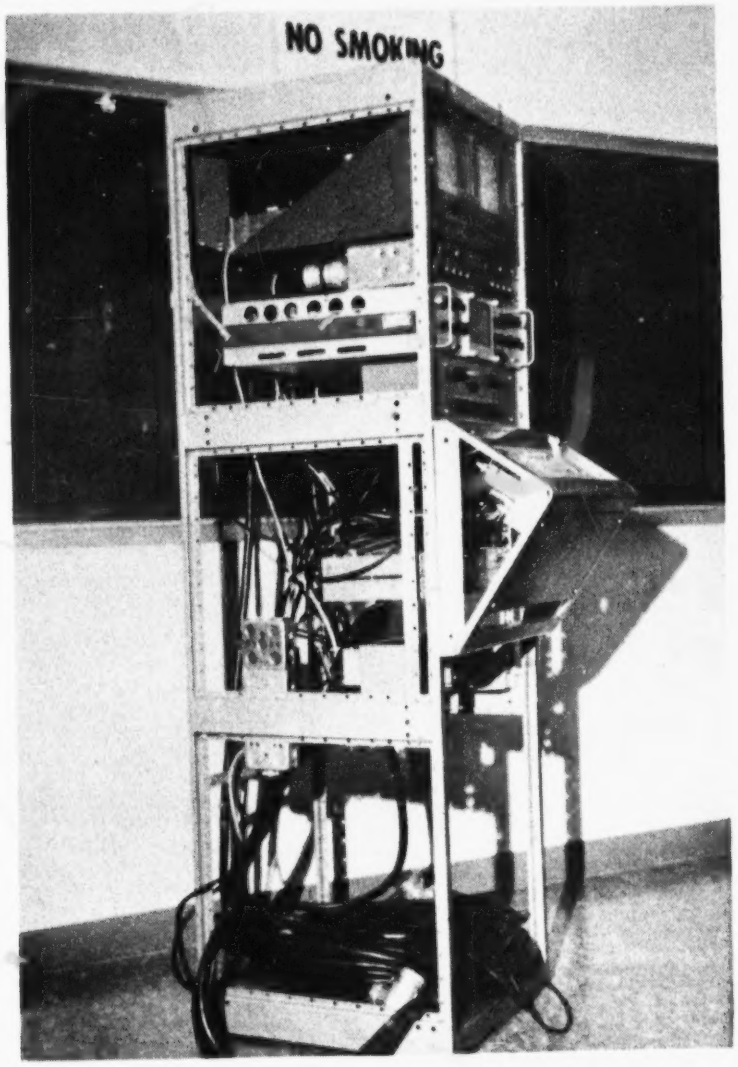

Fig. 6.

This portable console could be rolled through any standard doorway. It proved to be the best arrangement when no more than two cameras were needed.

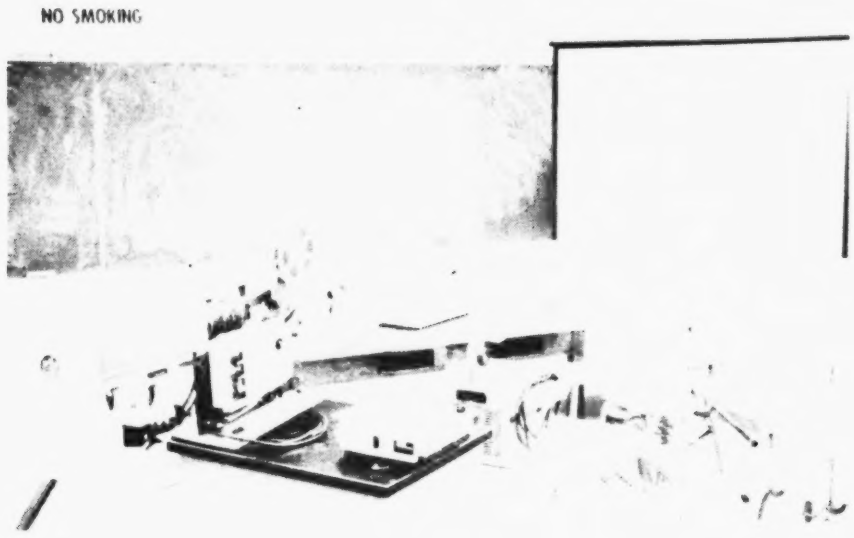

Fig. 7. A 16 m.m. motion picture projector, a 35 m.m. slide projector and an overhead projector were focused on the same area of a screen to provide a temporary "camera-chain".

Fig. 8. A small classroom doubling for TV studio is a poor arrangement for both classroom users and television production. Such a facility required meeting schedule problems and constant shifting of chairs and television equipment.

Fig. 9. A temporary camera station.

Fig. 10. A videotape recorder and a monitor-receiver were kept on a cart which could be quickly moved to any classroom for replay.

Fig. 11. A portable 3-section backdrop painted different shades of gray on either side improve lighting in difficult situations.

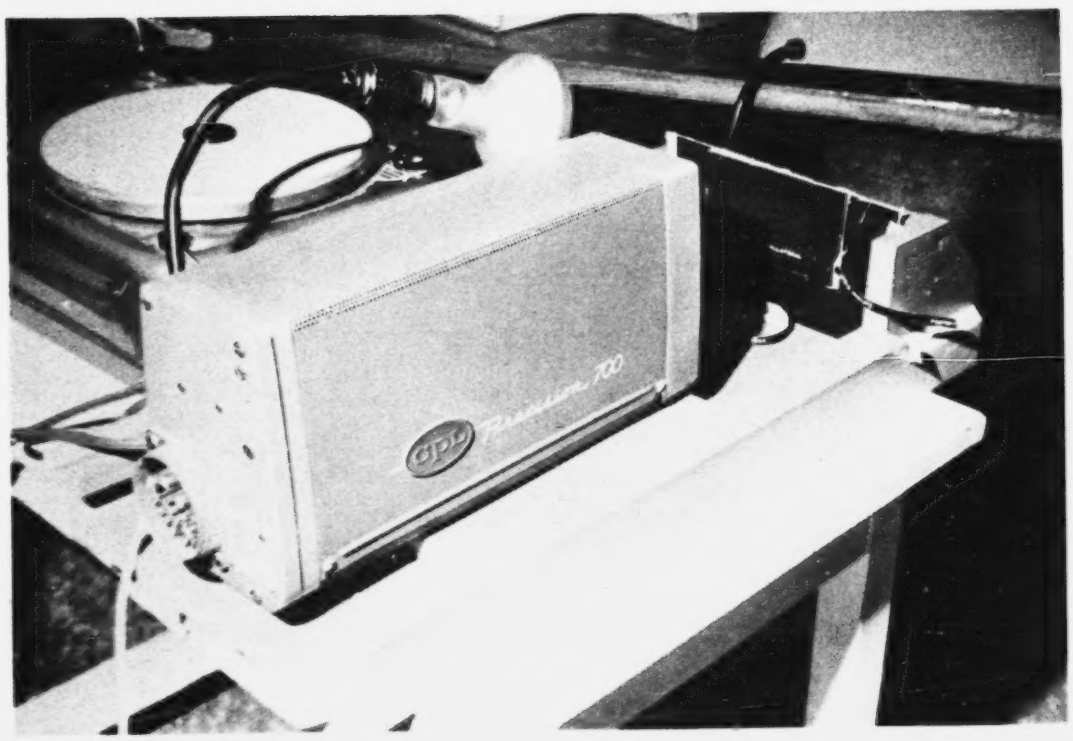

Fig. 12. This close-up camera arrangement was used for typewritten material and for superimposing definitive information.

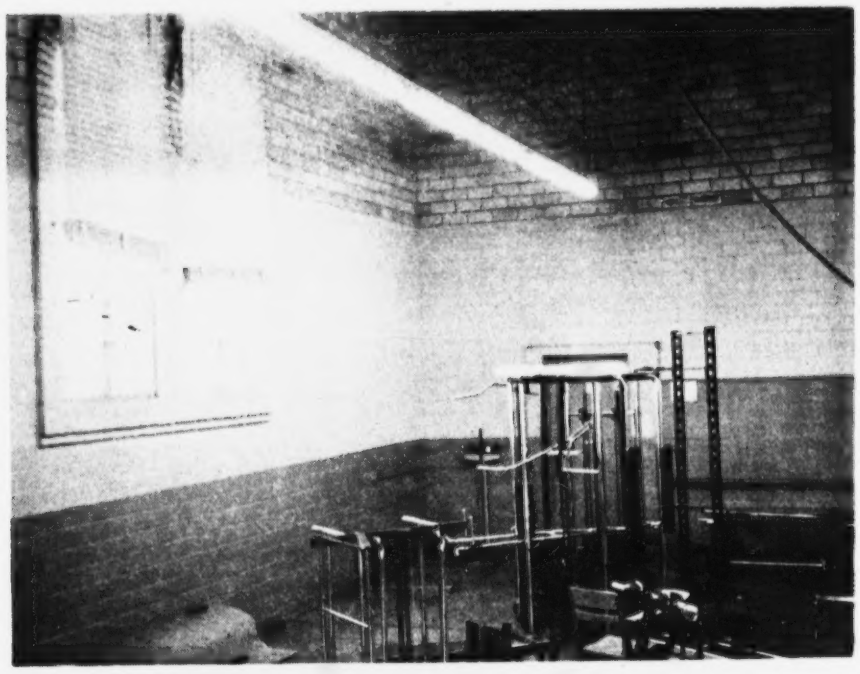

Fig. 13. Program production in small areas required a wide-angle lens.

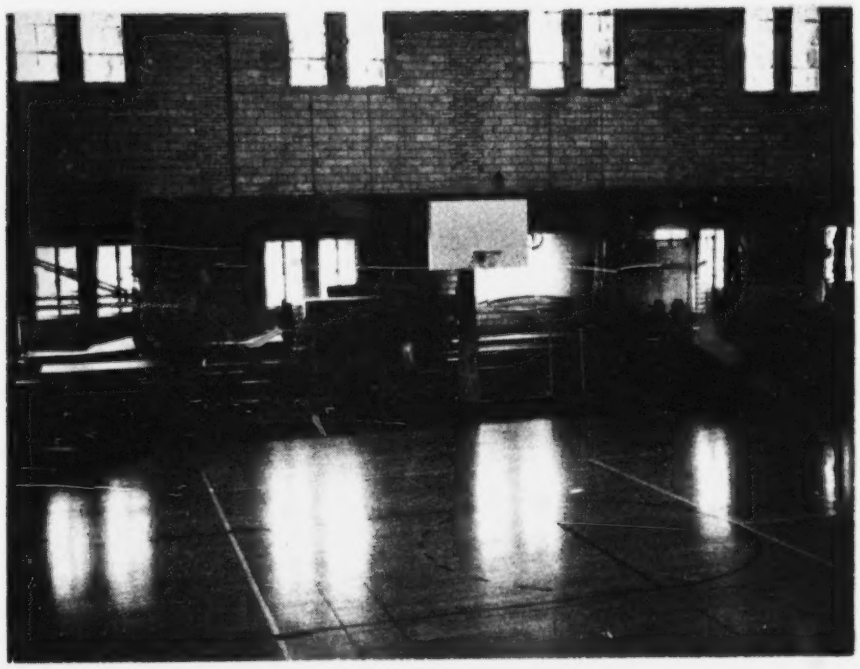

Fig. 14. Windows and glare on the floor severely limited production in the gymnasium.

CHAPTER VI

RESULTS

The six videotaped programs produced during the study are geared specifically for college students preparing to teach physical education in the public schools; however, all of the programs can be used for more than one purpose. Any program could be used for an in-service program for secondary school teachers. Four programs contain material which would be useful for the elementary school teacher, and three programs could be used for teaching sports skills in the gymnasium to students of any age.

"Knee Injuries"

A twenty-five minute program to provide the coach or future coach with some fundamental concepts necessary for understanding the nature of knee injuries, causes, prevention, and first aid and treatment. A review of the anatomical structure of the knee and related tissue includes:

A. Muscle tissue
   1. quadraceps group
   2. hamstrings group
   3. gastrocnemius
   4. sartorius
   5. gracilis
   6. popliteus

B. Ligamentous tissue
   1. posterior cruciate
   2. anterior cruciate
   3. tibial collateral
   4. fibular collateral
   5. oblique popliteal
   6. patellar

C. Bony tissue
   1. fibia
   2. femur
   3. tibia
   4. patella

D. Cartilaginous tissue
   1. lateral meniscus
   2. medial meniscus

The program emphasizes the role of related muscles for stabilizing the joint. Statistics substantiating the frequency of knee injuries and their cause are cited. Three models were used to

demonstrate the structure of the bones, cartilage, ligaments, and muscular tissue involved in injury. First aid and preliminary examination of knee injuries were demonstrated with a live model. Recommended for use in courses including instruction in first aid, care and prevention of athletic injuries, physiology of exercise, and coaching. (25 minutes.)

"Rehabilitation of Knee Injuries"

A thirty-minute program demonstrating four different methods for rehabilitating the knee after injury or surgery including:

A. the weighted boot technique
B. progressive resistance training
C. Klien's bench technique
D. isometric contractions

A program for coaches, physical educators, and trainers involved in rehabilitation of athletes. Sequence of rehabilitation and desirable equipment are demonstrated. Recommended for use in courses including instruction in care and prevention of athletic injuries, physiology of exercise, and coaching. (35 minutes.)

"Teaching Tumbling by Progression"

Begins with the fundamentals of tumbling as the foundation of any gymnastics program and emphasizes the importance of learning by progression. The necessity of lead-up exercises is emphasized.

The purpose of the lead-up exercises is to strengthen muscles commonly used for tumbling, to improve flexibility needed in tumbling, and to develop agility and balance. The skills as demonstrated by the volunteer gymnasts include:

A. Lead-up exercises
    1. galloping dog run
    2. squirrel hops
    3. forward or backward crab walk
    4. elephant walk
    5. wet cat walk
    6. bear walk
    7. duck waddle
    8. rabbit hop
    9. snail drag
    10. gorilla hops
    11. worm measure
B. Beginning tumbling stunts
    1. spiral rock
    2. forward roll
    3. forward roll to the back
    4. forward roll - arms folded
    5. forward roll - cross the legs

6. forward roll while holding toes
7. forward roll - hands behind head
8. backward roll over one shoulder
9. backward roll from jackknife position
10. football roll - (shoulder roll)
11. side roll

C. Elementary tumbling stunts
1. cartwheel
2. backward extension roll
3. backward extension roll to chest
4. backward roll to head stand
5. dive roll
6. kip over mat (neck spring)
7. head spring over mat

Each exercise is demonstrated and explained. Each stunt of both beginning and elementary tumbling is explained and demonstrated in its proper sequence. Recommended for in-service training programs, elementary and secondary methods courses, and for basic instruction courses in tumbling. (25 minutes.)

"The A.A.H.P.E.R. Youth Fitness Test"

A twenty-five-minute program presenting the history and development of the A.A.H.P.E.R. Youth Fitness program. A summary of the Kraus study, the development of the original norms, the Campbell-Ponhdorff study and its results, and the revised norms. An examination of each test item and its standardization points include:

A. pull ups and flexed arm hang for girls
B. sit ups
C. shuttle run
D. standing broad jump
E. 50-yard dash
F. softoall throw for distance
G. 600-yard run-walk

Recommended for in-service programs and courses including administration, elementary and secondary methods, tests and measurements, and for students preparing to take the test. (25 minutes.)

"The Mini-Tramp"

Contains a short introduction to the mini-tramp with a discussion of the contribution of the mini-tramp to the objectives of physical education. Emphasizes learning by progression and the safety aspects of the mini-tramp. The skills demonstrated include:

A. jumping up to the mini-tramp from the floor
B. jumping off mini-tramp to tumbling mats

C. tuck jump
D. pike jump
E. layout jump
F. jumping from mini-tramp to higher elevation
G. jumping from higher elevation to the mini-tramp and return
H. beginning of forward somersault progression

Shows ways the mini-tramp may be used in conjunction with other gymnastic apparatus. Recommended for in-service training programs, elementary and secondary methods courses, and for basic instruction in trampolining. (30 minutes.)

"Introduction to Trampolining"

Demonstrates trampoline fundamentals. The tape includes a discussion of the contribution of trampolining to the objectives of physical education. The safety rules for trampolining are discussed, with emphasis on the importance of proper instruction and supervision. Progression and instruction for teaching fundamental stunts are demonstrated with live talent on the trampoline. The skills demonstrated in their order of progression are:

A. controlled bounce
B. knee break stop
C. variety bounces (tuck, pike, layout)
D. seat drop
E. knee drop
F. hands and knee drop
G. straight leg back drop
H. front drop
I. kick out back drop
J. back pullover

Recommended for in-service training programs, elementary and secondary methods courses, and for basic courses in trampolining. (30 minutes.)

CHAPTER VII

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The portable instant-replay capabilities of the new closed-circuit instructional television equipment enable the instructor of college physical education to bring the gymnasium, the athletic field, the research laboratory, the natatorium, and the playground into the classroom. Videotape permits the physical education instructor to record athletic contests, demonstrations, lectures, and games for replay immediately or days later, as the situation demands. Using portable closed-circuit instructional television, physical education instructors may produce their own programs, using their own facilities for fulfilling specific needs in their own particular situation. The flexibility of the portable recorders allows program production and presentations which, in the past, have been economically and administratively impossible.

Program Evaluation

The six videotaped programs representing the final material product of this study demonstrate the production capabilities of closed-circuit instructional television. In addition to their being valuable for demonstrating methods and techniques of producing instructional programs from remote locations, the programs should prove to be useful, integrative material for undergraduate physical education courses.

Although evaluation of the programs was not within the scope of this study, department staff members who were consulted, who observed production, and who have previewed the programs, reacted very favorably. The true measure of the success of the study will be the degree of effective implementation of closed-circuit instructional television into the undergraduate physical education program.

Criteria for Selecting Equipment

As a result of this study, two criteria for selecting equipment for producing instructional television programs on remote locations were identified.

Physical and technical characteristics.--First, equipment should be selected which can be easily moved from one location to another and which can be made ready for operation in a matter

of minutes. The equipment should be small enough that two people can transport it and make it operational without difficulty. Equipment operation should require a minimum number of technical assistants, and technical requirements should be simple enough that instructors can learn to relocate, assemble, and adjust for production without intensive training.

Physical dimensions of a closed-circuit television system are closely related to the production capabilities of the equipment. The fundamental question concerning the amount of equipment necessary is, "Does the program require more than one camera?" Use of more than one camera necessitates the use of a switcher, a sync-generator, and a camera-control console. The additional equipment can more than double the initial cost of a one-camera system; and, of course, multiple-camera systems are much larger and require more technical assistance to operate.

The four-camera system used for most production during this study did not meet the criteria stated above; however, the two-camera system installed in the vertical rack was a good "compromise" unit. The two-camera unit has limited production potential, but the requirement of portability and ease of operation far outweighs the need for elaborate production.

Picture quality.--The second criteria, and one to which there is obviously no definite solution, is one of picture quality. Equipment salesmen certainly attempt to sell as much quality as they possibly can--keeping in mind, of course, that better quality means higher prices and greater profits. Also, television engineers and technicians prefer to work with high-quality equipment. This project allowed comparison of picture quality produced by relatively-expensive viewfinder vidicon cameras and very inexpensive cameras. Both one-inch and two-inch helical scan videotape recorders were compared for picture quality. Our observation was that for programs involving gross motor skills, such as tumbling, trampolining, weight lifting, and golf, etc., the inexpensive camera and one-inch videotape recorders were adequate. Programs requiring more detail, such as human anatomy, charts and graphs, black and white pictures, and motion pictures, required more expensive cameras and recording equipment.

Recommendations

1. The University should provide a Television Studio with a staff of technicians headed by a professional media producer with the responsibility of assisting in production in all areas of educational television.

   The professional staff of the proposed Television Services Department should be responsible for maintaining equipment at its peak operational capacity and

effectively coordinating the acquisition of new equipment, dissiminating information relative to the possible uses and capabilities of its department for educational purposes.

2. Television equipment, facilities, studio, and personnel should be available to University Faculty on short notice.

3. It should not be necessary for instructional staff members to become competent in assembling, adjusting, organizing, or transporting television equipment.

4. Faculty members from the various University Departments should be encouraged and assisted in undertaking seminar studies.

5. Teachers and administrators should work toward creating receptive attitudes toward educational television on the part of administrators, instructional staff, and students.

6. Attempts should be made to involve future teachers in all aspects of using C.C.T.V. for educational purposes.

7. Provisions should be included in departmental budgets for supporting research and development in educational television.

8. Educators should make the final decisions about the planning, development, and educational applications of television.

9. Further study should be carried out to investigate the possibilities for program production and improvement of instruction through C.C.T.V. in all areas of Health, Physical Education, and Recreation.